DEGRADATION RATE ENHANCEMENT METHODS OF ORGANIC MATERIALS BY VERMICOMPOST

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ABSTRACT

Composting of organic waste using earthworms (Vermicompost) is an alternative to municipal waste management cost and environmentally friendly. The study aims to determine the ratio between the decomposition of compost and vermicompost. Experiments using organic waste cities, treated in the form of composting (P) and vermicompost (V), which is repeated 3 times. Experiments are destructive to each observation (per week), up to week 5 which is the end of the experiment. Data obtained from experiments tested using a t-test to determine differences between treatments. The experimental results showed that the growth and development of the worms during the trial did not experience a noticeable increase. Observations on organic C and N-total in the media decomposition, treatment provision of vermicompost (V) has provided tangible results from early observations (Week 1) until the end of the trial (week 5) than in the treatment of compost (P).

Key words: Composting, Vermicompost, Decomposition

INTRODUCTION

Garbage in urban areas are the problems that never runs out, it relates to environmentally friendly waste management. The handling of urban waste is often overlooked and unsustainable (Kruljac, 2012), so a lot of landfills (landfill) of waste in urban areas still have the potential to cause problems in the form of leachate dangerous in landfill (Andrews, Masoner and Cozzarelli, 2012), contaminants aquifer soil in the environment around the landfill (Cozzarelli, et al., 2011) and the impact on the ecosystem in the area of health decline border city as a landfill (Douglas, 2008). It required the urgent need for decisive steps in processing alternative sustainable urban organic waste by using environmentally friendly and low cost (Sim and Wu, 2010).

Urban waste in the landfill is located, nearly 50 to 60 percent of the amount of waste disposed of in the form of organic waste (Edward, 2011). If the waste is organic waste is utilized as organic fertilizer raw material, then there will be huge savings in the supply of fertilizer plants. Earthworms are the largest animal biomass components of biological organisms and has provided services major contribution of biodiversity environment, so earthworms is considered a parameter to determine the level of biodiversity in an environment. Contributions earthworm on biodiversity can be seen in the process of pedogenesis, the development of soil structure, water regulation, nutrient cycling, primary production and a reduction in solid pollutants (Blouin, *et al*., 2013). Earthworms are soil organisms that can affect plant growth by improving the mineralization of organic matter contained in the soil. In addition the earthworm makes soil physical and chemical properties for the better (Bardgett, *et al.*, 2005). Earthworms have degrade organic matter contaminated metal and able to provide the analysis results C-organic, N-total and P-available on vermicompost decomposition (Pancadewi et al., 2015).

The research objective was to compare the decomposition process of composting with vermicompost.

MATERIALS AND METHODS

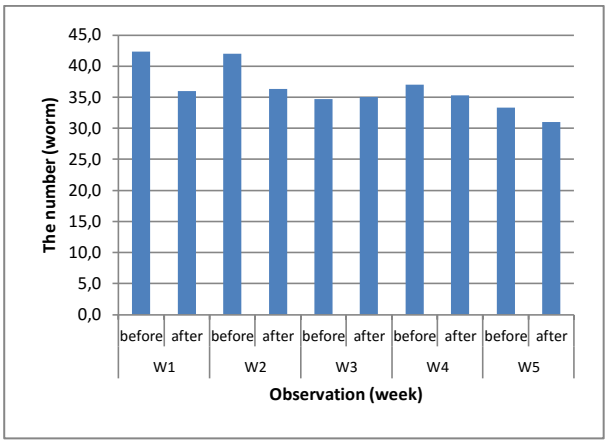
The experiments were performed in this study using organic waste treated in the form of compost and vermicompost. The study was conducted sightings per week until week 5 is the end of the experiment. The experiments used in the study is destructive in any observations made each week.

Various treatments used in these experiments was treated compost (P) and vermicompost is composting using earthworms *Lumbricus rubellus* (V), all treatment was repeated 3 times. Data obtained from experiments tested using a t-test to determine differences between treatments.

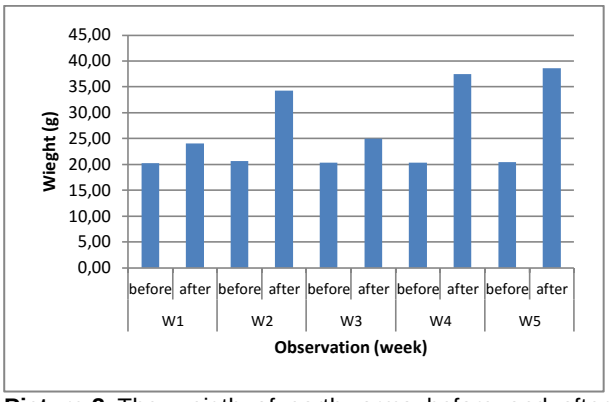
RESULTS AND DISCUSSION

3.1. Observations Earthworm

In experiments carried out observations on the number of earthworms and earthworm weight at the beginning of the experiment compared to the end of trial in the treatment of Vermicompost.



Picture 1. The number of earthworms before and after the experiment each week



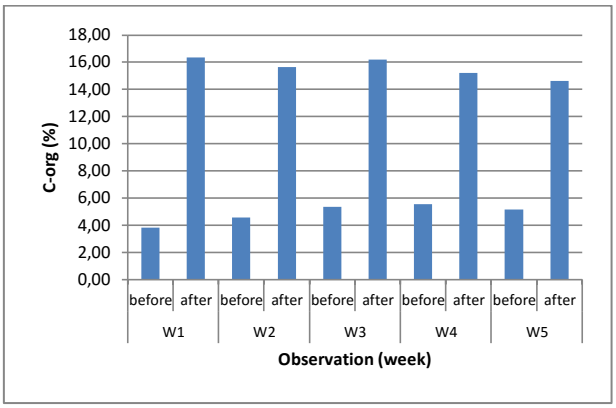
Picture 2. The weigth of earthworms before and after the experiment each week

Results of experiments on earthworms developments during the trial showed that the number of earthworms decreased compared to the time when inoculated on media experiment, but generally decrease in the number of earthworms do not give a real difference to the initial amount. Likewise gain of earthworms as a whole has increased, but in general an increase in weight of the worms did not show significant differences compared to the initial weight.

During the experiment done in-house incubator worm Faculty of Agriculture, UPN Veteran East Java with average air temperature of 33^{O}C, with low humidity. Earthworms are used during the trial (5 weeks) showed no real improvement. This is due to environmental conditions are somewhat less favorable and long trial was too short, so the development of earthworms to be slow. According to Edwards and Lofty (1972) suggested that earthworms are hemaphrodit, after copulation, clitellum will issue a cocoon, in which the embryo growing in a cocoon with an incubation period of between 5 to 20 weeks. Besides the availability of food, temperature and humidity environment will greatly affect embryo development earthworms (Edwards, 1998). Utilization of earthworms could be the answer as the technology is environmentally friendly, economically, and socially acceptable (Sharma et al., 2005).

3.2. Results Analysis of C-organic soil

Measurement of C-organic conducted to determine the amount of organic matter produced in the decomposition process of composting and vermicompost, so it can be different of the value of C-organic produced in each treatment.

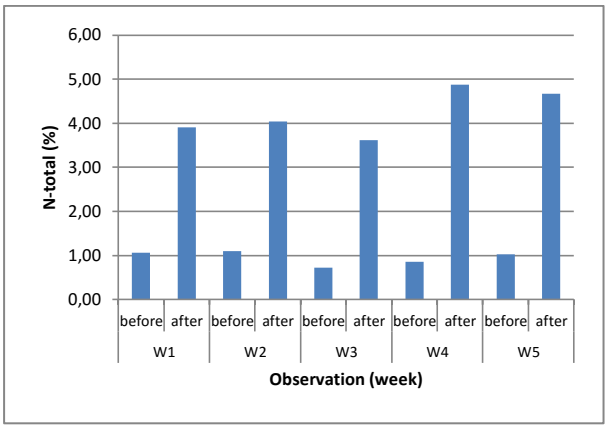


Picture 3. C-organic (%) experiment results

Results of C-organic in the trial obtained C-organic decomposition medium well on the composting process (P) and vermicompost (V) generally increased every week, but the C-organic process results vermicompost obtained higher scores and significantly different from the composting process, This shows that the process of vermicompost, earthworms have been consuming organic matter as feed for growth and also produced vermicompost which is the result of dirt earthworm earthworm digestive system process. According to Edwards and Lofty (1972) that earthworms are eating animals organic waste, earthworms are only a small part is used for the synthesis of body and partially ejected after the undigested decomposes into vermicompost shaped substrate in a short time.

3.3. Results Analysis of N-total

Measurement of N-total conducted to determine the amount of organic matter produced in the decomposition process of composting and vermicompost, so it can be different of the value of N-total produced in each treatment.



Picture 4. N-total (%) experiment results

Results of experiments with N-total parameter shows that both in the process of composting and vermicompost increased each week. But the results of composting using earthworms provide a higher value than composting. The presence of earthworms in the process of vermicompost, able to break down organic matter into even more simple, such as N, C, P, K through enzymatic processes in the body, (Ndegwa and Thompson 2001) that composting using vermicompost produces higher nutrients than composting usual (without earthworms). In the process of vermicompost, earthworms outlines the fraction of the organic material into smaller sizes with increased surface area (Chan and Griffiths 1988). In the process of vermicompost, important nutrients in such as nitrogen, potassium, phosphorus, and calcium becomes available in an organic medium which is converted via the micro-organisms in the intestines into a form that is much more soluble and available to plants than the materials of origin (Ndegwa and Thompson 2001) ,

CONCLUSION

It can be concluded that:

1. During the experiment the growth and development of earthworms no increase real at each observation
2. Defradation of organic matter using earthworms in vermicompost give value element of degradation is higher and significantly different from the composting process.
3. Method vermicompost can increase the levels of nutrients in the end product in the form of casting than composting methods.

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